
**2.0 Regulation
Governing
Individual Onsite
Wastewater
Disposal**

Design Standard VIII
Sand Filters

Mississippi State Department of Health
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Design Standard VIII

Sand Filters

I. Introduction

The sand filter is used to polish effluents from septic tanks or aerobic treatment process with the final disposition of the effluent disposal by land application. Sand filters can be constructed as a standard or alternative (shallow) filter. Each of these systems are useful for a particular range of soil/site conditions. Sand filters are beds of granular materials 12 to 24 inches deep which have graded gravel above and below the filter. Distribution and collection pipes are placed in the graded gravel to allow the distribution of the wastewater and collection of the filtrate.

II. Influent Requirements

1. Pre-treatment: Wastewater applied to a sand filter must receive, as a minimum, primary treatment in a septic tank. A sand filter can also be used to polish effluent from an aerobic treatment unit. All fats, oils and grease should be removed by a grease separator or trap before the pretreatment unit.
2. Wastewater strength - BOD₅ : The sand filter is best suited for treatment of household wastewater. Biochemical Oxygen Demand (BOD₅), a useful wastewater strength indicator, for house wastewater (septic tank effluent) is generally below 230 mg/l. If BOD₅ is greater than 230 mg/l, clogging of the filter may occur at some point in time.
3. Daily wastewater flow design estimates:
 - a. Residential - For all residential applications a minimum wastewater design flow estimate of at least 150 gallons/bedroom/day will be used. Adjustment to the flow rate may be necessary for additional plumbing (hot tubs, jacuzzi, or other large volume fixtures) or persons.
 - b. Non-residential - For non-residential application consult Table I and/or EPA Design Manual for type of operation.
4. Septic Tank Effluent Filter - An effluent filter will further reduce solids and organic load to the sand filter and assure long-term protection of the filter from clogging. If the system is to be pumped, a combined filter and pump system may be used.

Table I Estimated Wastewater Flow Chart

TYPE OF FACILITY	ESTIMATED FLOW [gpd]
Food service	
Restaurant	35/seat
Restaurant (24hr.)	50/seat
Short Order	35/car space
Bar	20/seat
Motel	40/bed space
Motel (with kitchen)	50/bed space
Apartment House	190/bed space
Resort, Camp, Cottage	125/unit
Offices, Factories, Dairies (without kitchen)	15/employee
(with showers)	add 10/employee
Day School, Headstart, etc. (with cafeteria)	16-20/student space
Day School (without cafeteria)	10-15/student space
Swimming Pools	10/max. swimmer occupancy
	10/employee
Airport (small)	10/employee
Laundry (self service)	580/machine
Shopping center	1/parking space
	10/employee
R V Park (no sewer hookups)	50/space
R V Park (sewer hookups)	100/space
Churches (without kitchen)	4/seat
Churches (with kitchen)	6/seat

NOTE: If records are available for water usage and/or meals served per day for existing establishments, these may be used in computing estimated flow. See also EPA Design Manual.

III. Location

1. All components of the onsite wastewater disposal system shall be located a minimum of:
 - a. five feet from any dwelling.
 - b. ten feet from any property line.
2. Any vessel holding wastewater shall be located a minimum of 50 feet from any public, private or individual potable water source.
3. The sand filter shall be located at a lower elevation and a minimum of 100 feet from any public, private or individual potable water source.
4. Potable water lines shall not pass under or through any part of the sand filter. Where a water supply line must cross a sewer line, the bottom of the water service within ten feet of the point of crossing, shall be at least 12 inches above the top of the sewer line. The sewer line shall be of Schedule 40 pipe with cemented joints at least ten feet on either side of the crossing. Water and sewer lines shall not be laid in the same trench. The water and sewer lines, when laid on the same elevation, shall maintain a minimum separation distance of 10 feet.
5. The surface of or the surface above the sand filter shall not be used for vehicular traffic or vehicular parking.
6. No portion of an onsite wastewater disposal system shall be located under dwellings or other permanent structures.
7. Sand filters shall not be located in depressed areas where surface water will accumulate. Provision shall be made to minimize the flow of surface water over the sand filter.
8. Slopes of greater than 30% shall not be considered for sand filter installation.
9. Where all or part of the onsite wastewater disposal system is proposed to be installed on property other than the owner's, an easement in perpetuity shall be legally recorded in the proper county. The easement shall be of sufficient area to permit access, construction and maintenance of the onsite sewage disposal system.
10. No site for a sand filter or expansion area shall be approved which is located wholly within an area which is frequently flooded, swamp, marsh, or wetland. Except that if permits have been issued by the proper regulatory agency authorizing the use of wetlands for

building sites, the property shall be evaluated using standard soil and site criteria for IOWDS.

11. When a proposed lot is located partially within a frequently flooded area, that portion of said lot not within the flood prone area may be considered for approval for the sand filter or disposal area.
12. Easements or right-of-way areas for utilities, surface or subsurface drainage, roads, streets, ponds or lakes shall not be used as available space for location of sand filters.

IV. Construction

1. Sizing

The size of the standard and alternate sand filter shall be as follows:

Number of Bedrooms	Lineal Feet of Filter Trench
Two bedrooms or Less	100 Feet
Three bedrooms	150 Feet
Add 50 Lineal Feet of Filter for Each Additional Bedroom Over Three	

2. General

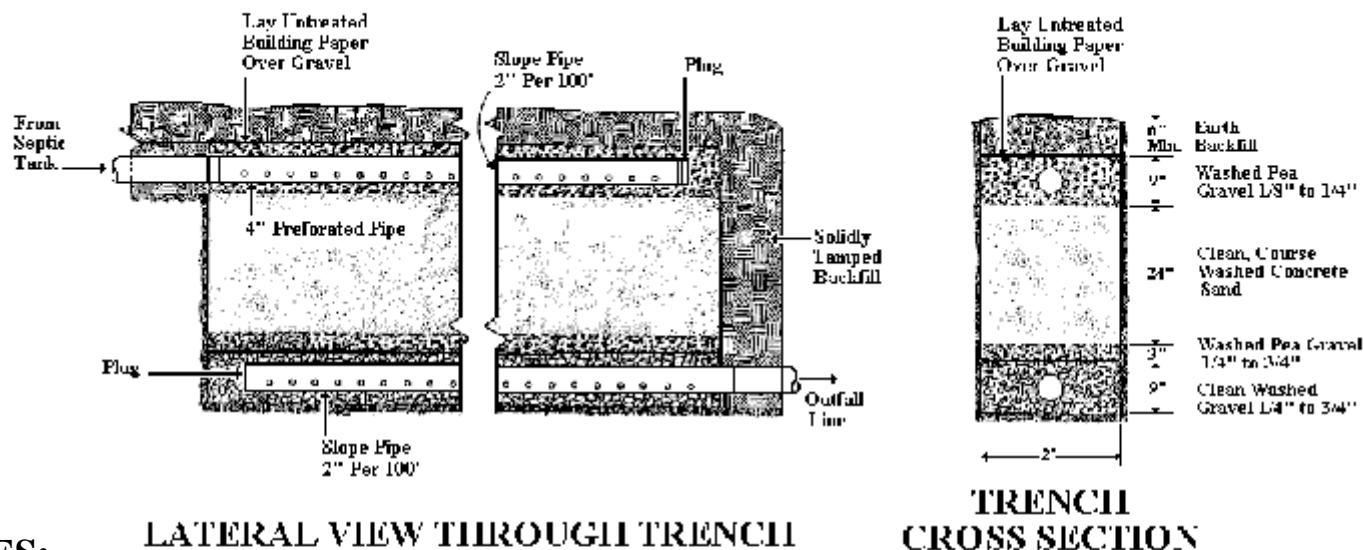
The sand filter shall be lined with a heavy duty synthetic 30 - 45 mil membrane, such as ethylene propylene diene monomer (EPDM) rubber, polyvinyl chloride, or polyethylene.

3. Standard Trench [Figure I]

- a. The standard trench is constructed to a depth of 42 inches minimum but no greater than 48 inches with a width of two feet. Once the trench is completed in length as determined by the number of bedrooms, the underdrain is constructed.
- b. The underdrain consists of four and one-half inches of clean washed gravel (1/4" to 3/4") then a four inch perforated pipe capped at the beginning of the trench is placed on a grade of two inches per 100 feet. Additional clean washed gravel (1/4" to 3/4") is placed over the pipe for a total depth of nine inches. The underdrain is completed by placing three inches of washed pea gravel (1/8" to 1/4") over the clean washed gravel.

- c. The filter is constructed from clean coarse washed concrete sand placed in the trench in six inch lifts and flooded to settle the sand in the filter. This process is repeated until a depth of 24 inches of sand is placed in the trench. Once the filter media is flooded and settled, the distribution network is constructed.
- d. The distribution network consists of three and one-half inches of washed pea gravel (1/8" to 1/4") with a four inch perforated pipe capped at the end of the trench, installed as near level as possible. Additional washed pea gravel (1/8" to 1/4") is placed over the perforated pipe to give a total of nine inches.
- e. Backfill is then placed over the system to a minimum depth of six inches. The backfill is placed in by hand.

Figure I
Standard Sand Filter Trench



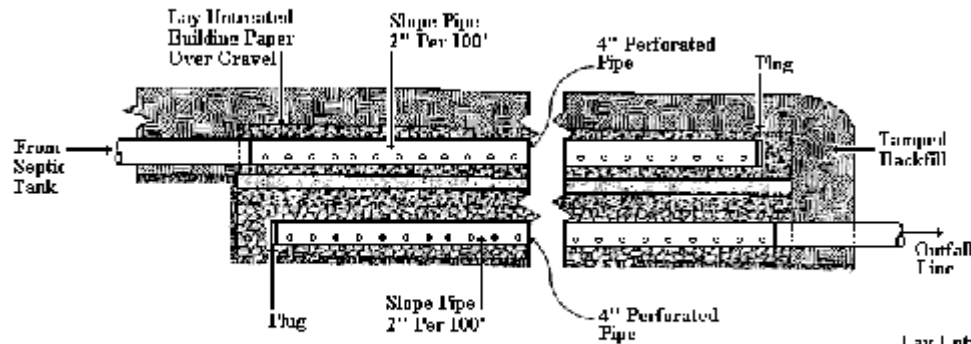
NOTES:

1. To be used following a septic tank, only where there is a suitable discharge point, and where topography will not permit proper discharge from standard sand filter trench.
2. For 2-bedroom home, trench must be at least 100 feet in length. For 3-bedroom home, trench must be at least 150 feet in length. Add 50 feet of filter for each additional bedroom
3. Do not drive trucks or other heavy equipment over filter trench.
4. Backfill by hand.

4. Alternative [Figure II]

- a. The alternative trench is constructed to a depth of 29 inches minimum on the low side and a minimum of 27 inches on the high side and a maximum of 35 inches on the low side and 33 inches on the high side. The trench width is three feet. Once the trench is completed in length as determined by the number of bedrooms, the underdrain is constructed.
- b. The underdrain is constructed by placing a nine inch wide strip of clean washed gravel (1/4" to 3/4") to a depth of three inches. A four inch perforated pipe capped at the beginning of the trench is placed on a grade of two inches per 100 feet. Additional clean washed gravel (1/4" to 3/4") is placed over the pipe for a total depth of nine inches. The underdrain is completed by placing three inches of washed pea gravel (1/8" to 1/4") over and around the clean washed gravel.
- c. The filter is constructed from clean coarse washed concrete sand placed in the trench in six inch lifts and flooded to settle the sand in the filter. This process is repeated until a depth of 12 inches of sand is placed on the high side in the trench. Once the filter media is flooded and settled, the distribution network is constructed.
- d. The distribution network consists of three and one-half inches of washed pea gravel (1/8" to 1/4") with a four inch perforated pipe capped at the end of the trench installed as near level as possible on the high side of the filter. Additional washed pea gravel (1/8" to 1/4") is placed over the perforated pipe to give a total of nine inches.
- e. Backfill is then placed over the system to a minimum depth of six inches. The backfill is placed in by hand.

Figure II
Alternative Sand Filter Trench



Lateral View Through Trench

NOTES:

1. To be used following a septic tank, only where there is a suitable discharge point, and where topography will not permit proper discharge from standard sand filter trench.

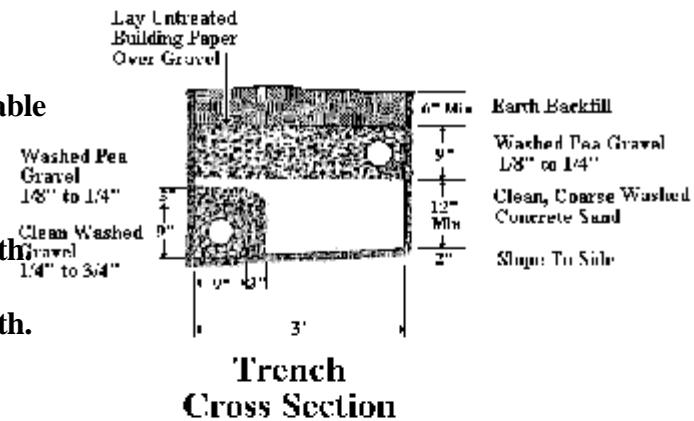
2. For 2-bedroom home, trench must be at least 100 feet in length.

For 2-bedroom home, trench must be at least 100 feet in length.

Add 50 feet of filter for each additional bedroom

3. Do not drive trucks or other heavy equipment over filter trench.

4. Backfill by hand.



**Trench
Cross Section**

5. Disinfection

The treated effluent from a sand filter must be disinfected in accordance with Design Standard XI, Disinfection.

6. Final Disposal

The treated effluent from a sand filter shall be disposed of by overland application in accordance with Design Standard X, Overland Discharge.

7. Pumping of Effluent

In cases where pumping of effluent from the treatment facility or the sand filter is required, the pump and pump chamber must be in compliance with Design Standard XII, Pumps and Pump Chambers.